to the other, and has given his views of the cause.[1] The precaution against this effect was not to put the metals into the acid until the proper temperature had been given to both parts of it, and then to observe the *first effect* produced, accounting that as the true indication, but repeating the experiment until the result was certain.

907. *Effect of motion.*—This investing fluid (906) made it necessary to guard against the effect of successive rest and motion of the metal in the fluid. As an illustration, if two tin wires (869) be put into dilute nitric acid, there will probably be a little motion at the galvanometer., and then the needle will settle at o°. If either wire be then moved, the other remaining quiet, that in motion will become positive. Again, tin and cadmium in dilute sulphuric acid gave a strong current, the cadmium being positive, and the needle was deflected 80°. When left, the force of the current fell to 35°. If the cadmium were then moved it produced very little alteration; but if the tin were moved it produced a great change, not showing, as before, an increase of its force, but the reverse, for it became more negative, and the current force rose up again to 80°.[2] The precaution adopted to avoid the interference of these actions, was not only to observe the first effect of the introduced wires, but to keep them moving from the moment of the introduction!

908. The above effect was another reason for heating the acids, etc. (906) before the wires were immersed; for in the experiment just described, if the cadmium side were heated to boiling, the moment the fluid was agitated on the tin side by the boiling on the cadmium side, there was mor effect by far produced by the motion than the heat: for the heat at the cadmium alone did little or nothing, but the jumping of the acid over the tin made a difference in the current of 20° or 30°.

909. *Effect of air.*—Two platinum wires were put into cold

[1] *Annales de Chimie,* 1830, xlv. p. 40.

[2] Tin has some remarkable actions in this respect. If two tins be immersed in succession into dilute nitric acid, the one last in is positive to the other at the moment: if, both being in, one be moved, that is for the time positive to the other. But if dilute sulphuric acid be employed, the last tin is always negative: if one be taken out, cleaned, and re-

immersed, it is negative: if, both being in and neutral, one be moved, it becomes negative to the other. The effects with muriatic acid are the same in kind as those with sulphuric acid, but not so strong. This effect perhaps depends upon the compound of tin first produced in the sulphuric and muriatic acids tending to acquire some other and more advanced state, either in relation to the oxygen, chlorine or acid concerned, and so adding a force to that which at the first moment, when only metallic tin and acid are present, tends to determine a current.

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